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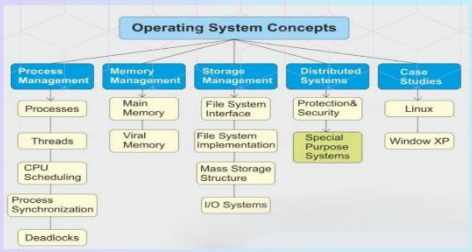
FUNCTIONS OF OPERATING SYSTEM



Following are key functions of an Operating System:

- Device Management
- Process Management
- Storage Management
- Memory Management
- Case Studies

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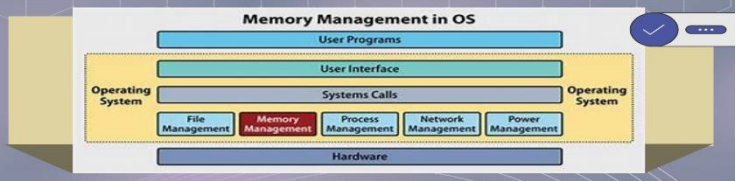
COMPUTER OPERATING SYSTEM

MEMORY MANAGEMENT



WHAT IS MEMORY MANAGEMENT?

IN A MULTIPROGRAMMING COMPUTER, THE OPERATING SYSTEM RESIDES IN A PART OF MEMORY, AND THE REST IS USED BY MULTIPLE PROCESSES. THE TASK OF SUBDIVIDING THE MEMORY AMONG DIFFERENT PROCESSES IS CALLED MEMORY MANAGEMENT. MEMORY MANAGEMENT IS A METHOD IN THE OPERATING SYSTEM TO MANAGE OPERATIONS BETWEEN MAIN MEMORY AND DISK DURING PROCESS EXECUTION.

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COMPUTER OPERATING SYSTEMS

What is Computer Operating System?

An operating system is the primary software that manages all the hardware and other software on a computer. The operating system, also known as an "OS", interfaces with the computer's hardware and provides services that applications can use

An operating system is the core set of software on a device that keeps everything together. Operating systems communicate with the device's hardware.

Familiar desktop operating systems include Microsoft Windows, Apple macOS, Google's Chrome OS, and Linux. The dominant smartphone operating systems are Apple's iOS and Google's Android.

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TYPES OF OPERATING SYSTEMS

Operating System Types:-

Single User system	Multi-programming
Multi-processing	Multi-user system
Multi-tasking	Distributed Operating System
Real-time O.S	Batch Processing

Explore Now!

FOLLOWING ARE TYPES OF OPERATING SYSTEMS:

-->Time Sharing Operating System
-->Batch Processing Operating System
-->Multiprogramming in Operating System
-->Real Time Operating System (RTOS)

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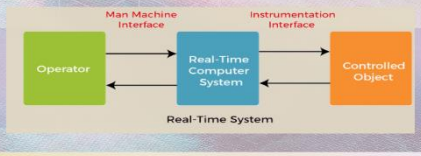
COMPUTER OPERATING SYSTEM

REAL TIME OPERATING SYSTEM



What is RTOS?

A real-time operating system (RTOS) is an operating system (OS) for real-time computing applications that processes data and events that have critically defined time constraints. An RTOS is distinct from a time-sharing operating system, such as Unix, which manages the sharing of system resources with a scheduler, data buffers, or fixed task prioritization in a multitasking or multiprogramming environment. Processing time requirements need to be fully understood and bound rather than just kept as a minimum. All processing must occur within the defined constraints

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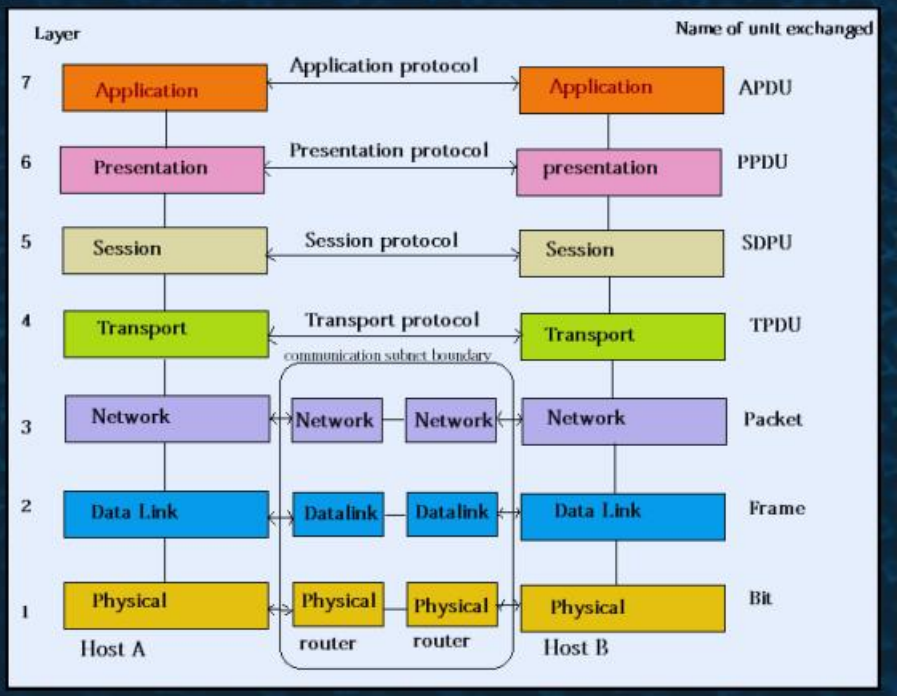
OSI REFERENCE MODEL



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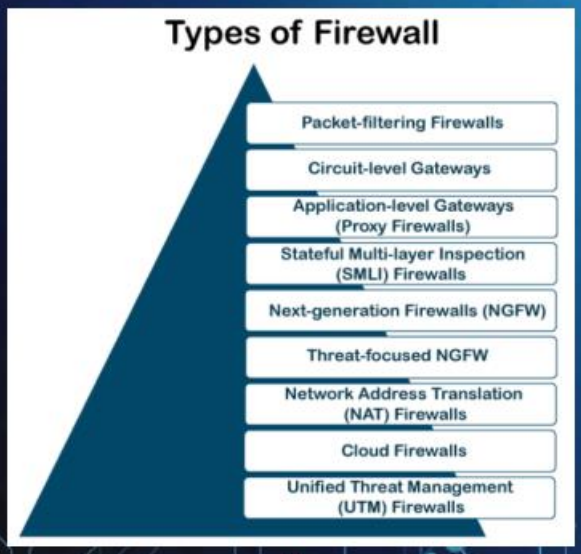
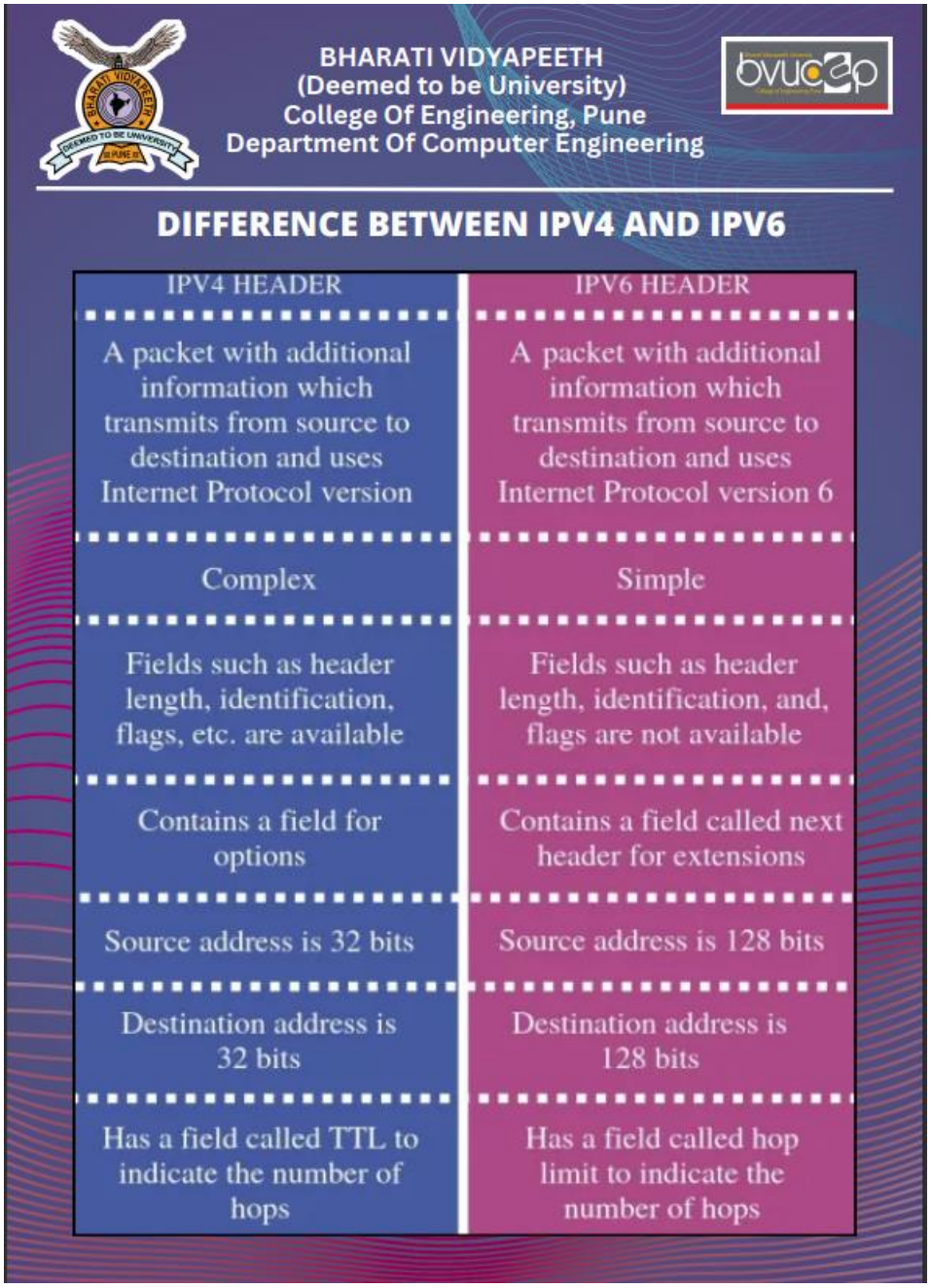
TYPES OF FIREWALLS

There are mainly three types of firewalls, such as **software firewalls, hardware firewalls, or both**, depending on their structure. Each type of firewall has different functionality but the same purpose. However, it is best practice to have both to achieve maximum possible protection.
A hardware firewall is a physical device that attaches between a computer network and a gateway. For example- a broadband router. A hardware firewall is sometimes referred to as an **Appliance Firewall**.
On the other hand, a software firewall is a simple program installed on a computer that works through port numbers and other installed software. This type of firewall is also called a **Host Firewall**.
Besides, there are many other types of firewalls depending on their features and the level of security they provide. The following are types of firewall techniques that can be implemented as software or hardware:

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DIFFERENCE BETWEEN IPV4 AND IPV6
IPV4 HEADER
IPV6 HEADER
A packet with additional information which transmits from source to destination and uses Internet Protocol version
A packet with additional information which transmits from source to destination and uses Internet Protocol version 6
Complex
Simple
Fields such as header length, identification, flags, etc. are available
Fields such as header length, identification, and, flags are not available
Contains a field for options
Contains a field called next header for extensions
Source address is 32 bits
Source address is 128 bits
Destination address is 32 bits
Destination address is 128 bits
Has a field called TTL to indicate the number of hops
Has a field called hop limit to indicate the number of hops

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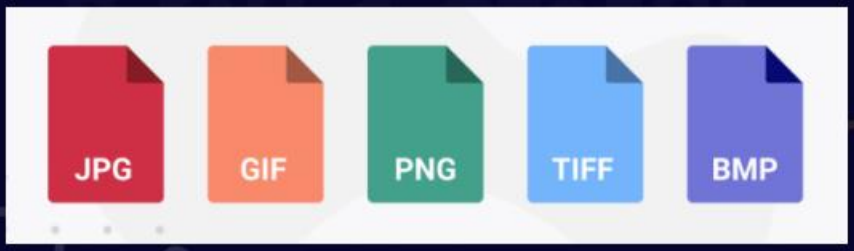
DIFFERENT FILE FORMATS

File Name	Description
JPEG/JPG (Joint Photographers' Expert Group)	Most popular lossy image format. Allows users to specify what level of compression they desire.
PNG (Portable Network Graphics)	Best of lossless image formats. Widely supported across web. Allows you to include an alpha channel within file.
BMP (BitMaP)	Would avoid if possible. They offer little to no compression which results in unnecessarily large files.
TIFF/TIF (Tagged Image File Format)	Offers both compressed and uncompressed versions. Compressed are similar to PNG and uncompressed is similar to BMP.
PDF (Portable Document Format)	Most widely used document format. Great vector image format. Created by Adobe.
EPS (Encapsulated PostScript)	Most common vector image format. Standard format for print industry.
GIF (Graphics Interchange Format)	Lossless format that supports both animated and static images. Great for webpage banner ads.



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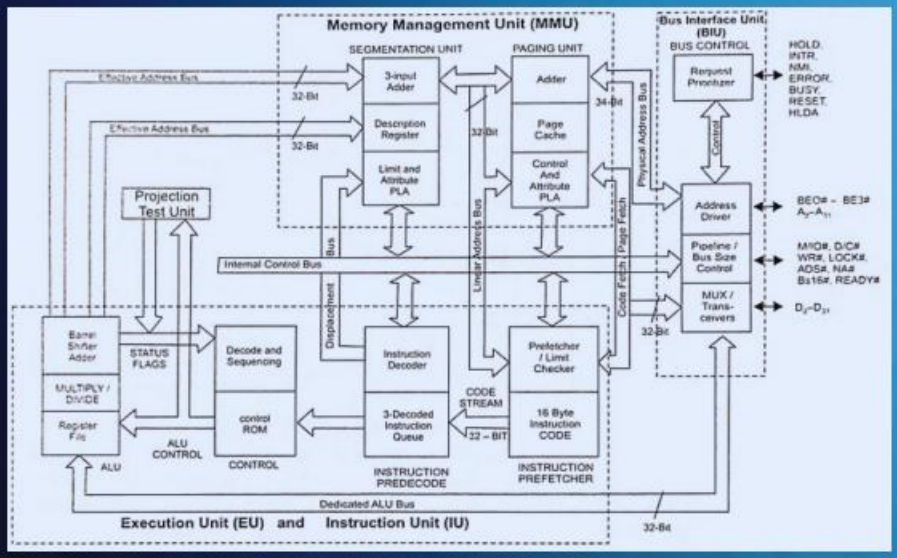
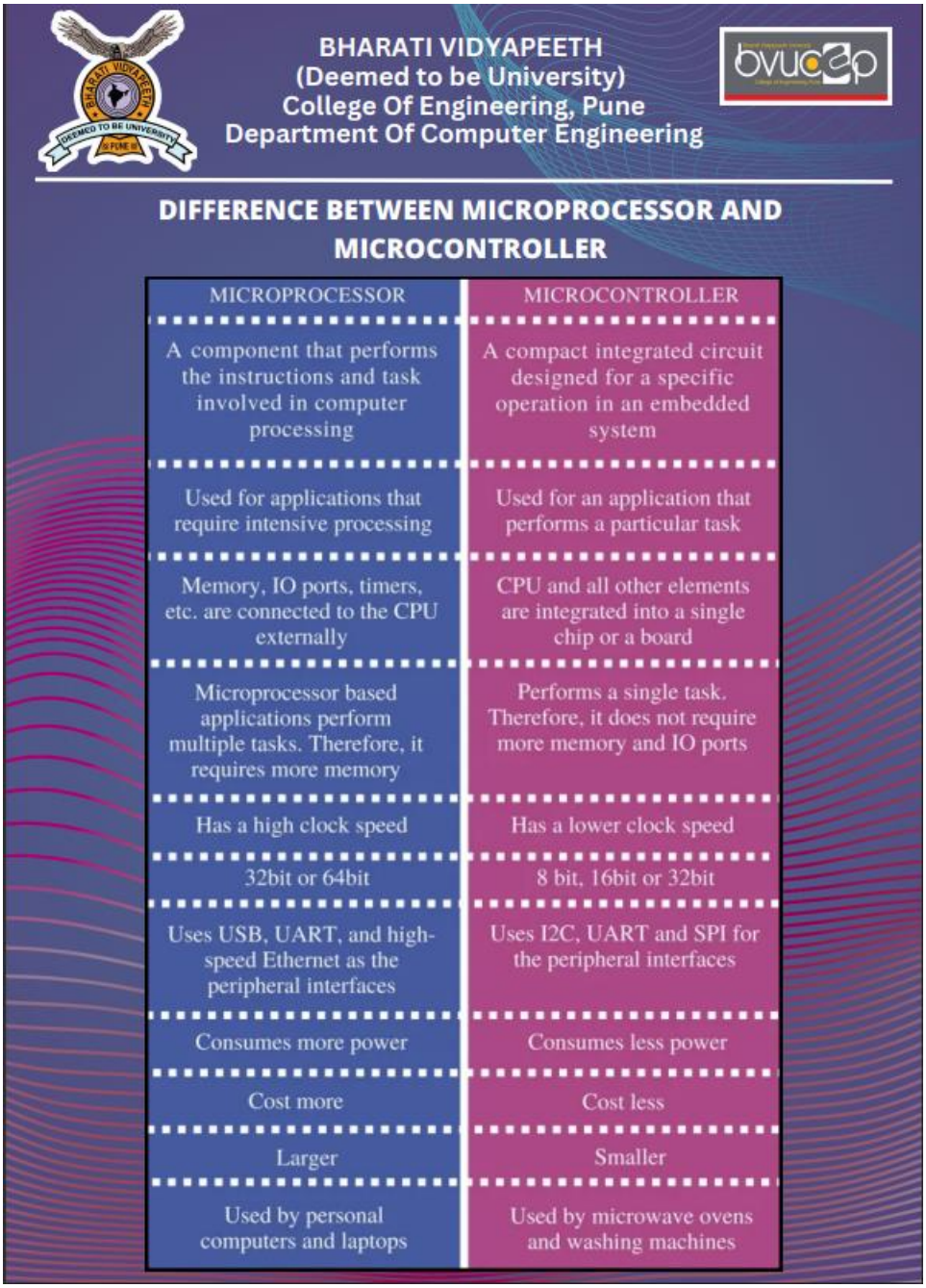
GENERAL DETAILED ARCHITECTURE OF 80386 PROCESSOR



Features of 80386

- As it is a 32-bit microprocessor. Thus has a 32-bit ALU.
- 80386 has a data bus of 32-bit.
- It holds an address bus of 32 bit.
- It supports physical memory addressability of 4 GB and virtual memory addressability of 64 TB.
- 80386 supports a variety of operating clock frequencies, which are 16 MHz, 20 MHz, 25 MHz, and 33 MHz.
- It offers 3 stage pipeline: fetch, decode and execute. As it supports simultaneous fetching, decoding, and execution inside the system.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DIFFERENCE BETWEEN MICROPROCESSOR AND MICROCONTROLLER
MICROPROCESSOR
MICROCONTROLLER
A component that performs the instructions and task involved in computer processing
A compact integrated circuit designed for a specific operation in an embedded system
Used for applications that require intensive processing
Used for an application that performs a particular task
Memory, IO ports, timers, etc. are connected to the CPU externally
CPU and all other elements are integrated into a single chip or a board
Microprocessor based applications perform multiple tasks. Therefore, it requires more memory
Performs a single task. Therefore, it does not require more memory and IO ports
Has a high clock speed
Has a lower clock speed
32bit or 64bit
8 bit, 16bit or 32bit
Uses USB, UART, and high-speed Ethernet as the peripheral interfaces
Uses I2C, UART and SPI for the peripheral interfaces
Consumes more power
Consumes less power
Cost more
Cost less
Larger
Smaller
Used by personal computers and laptops
Used by microwave ovens and washing machines

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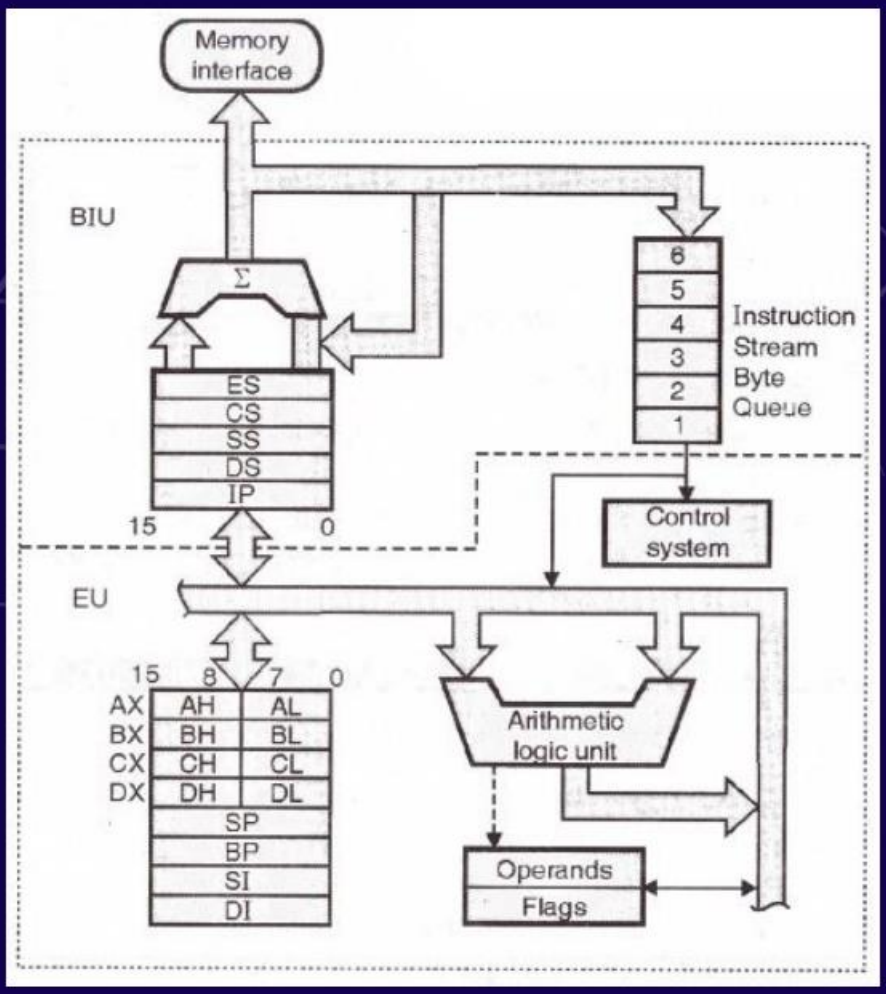
GENERAL DETAILED ARCHITECTURE OF 8086 PROCESSOR



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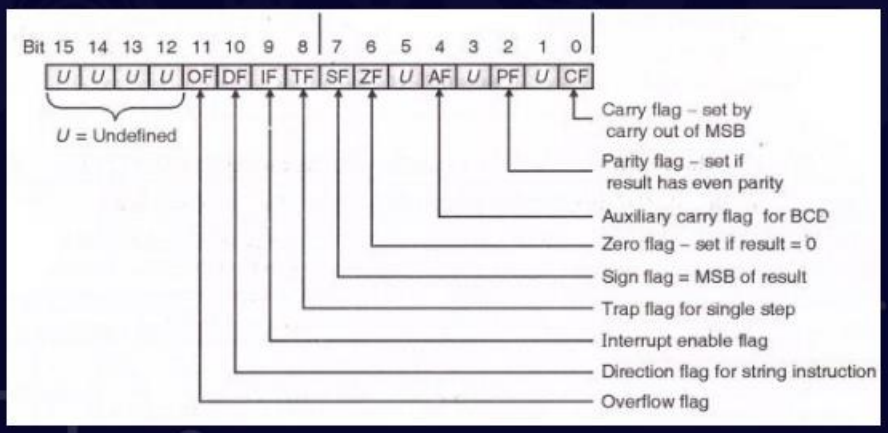
FLAG REGISTERS OF 8086

The flag register is a 16-bit register in the Intel 8086 microprocessor that contains information about the state of the processor after executing an instruction. It is sometimes referred to as the status register because it contains various status flags that reflect the outcome of the last operation executed by the processor.

The flag register is an important component of the 8086 microprocessor because it is used to determine the behavior of many conditional jump and branch instructions. The various flags in the flag register are set or cleared based on the result of arithmetic, logic, and other instructions executed by the processor.

The flag register is divided into various bit fields, with each bit representing a specific flag. Some of the important flags in the flag register include the carry flag (CF), the zero flag (ZF), the sign flag (SF), the overflow flag (OF), the parity flag (PF), and the auxiliary carry flag (AF). These flags are used by the processor to determine the outcome of conditional jump instructions and other branching instructions.



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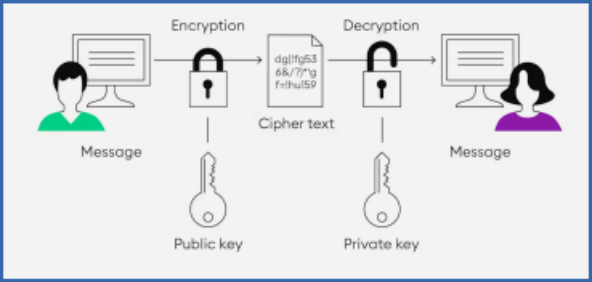
Asymmteric Encryption



- Asymmetric encryption, also known as public-key encryption, uses a pair of keys - a public key and a private key. The public key is shared with others, while the private key is kept secret.
- Encryption: The public key is used to encrypt the data or message, ensuring that only the holder of the corresponding private key can decrypt it.
- Security: Asymmetric encryption provides a higher level of security compared to symmetric encryption, as the private key is not shared or transmitted.
- Key Exchange: Asymmetric encryption can facilitate secure key exchange between two parties without the need for a secure channel.
- Authentication: Asymmetric encryption can be used for authentication purposes, as the private key can be used to generate a digital signature that verifies the identity of the sender.
- Versatility: Asymmetric encryption can be used for various purposes, including secure communication, digital signatures, secure file sharing, and secure online transactions.
- Scalability: Asymmetric encryption allows for secure communication between multiple parties using a single public key, making it scalable for large-scale applications.
- Implementation: Common algorithms used in asymmetric encryption include RSA, Diffie-Hellman, and Elliptic Curve Cryptography (ECC).
- Practical Applications: Asymmetric encryption is widely used in secure email communication, SSL/TLS for secure web browsing, VPNs, and secure messaging applications.

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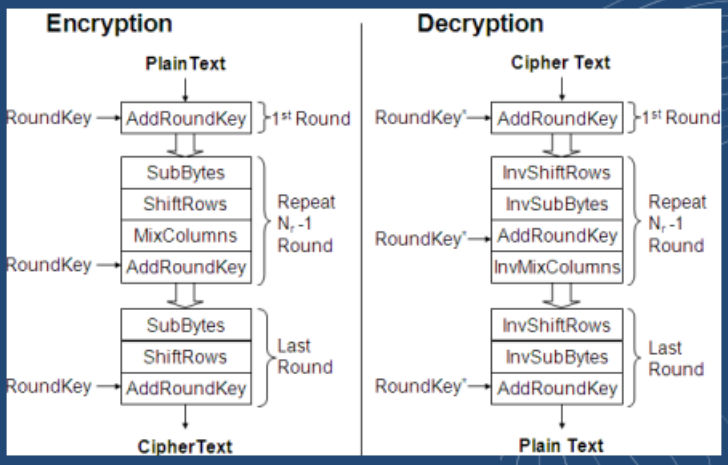
Advanced Encryption Standard (AES)



Advanced Encryption Standard (AES)

- It is a specification for the encryption of electronic data established by the U.S National Institute of Standards and Technology (NIST) in 2001.
- AES relies on substitution-permutation network principle which means it is performed using a series of linked operations which involves replacing and shuffling of the input data.
- AES performs operations on bytes of data rather than in bits. Since the block size is 128 bits, the cipher processes 128 bits (or 16 bytes) of the input data at a time.

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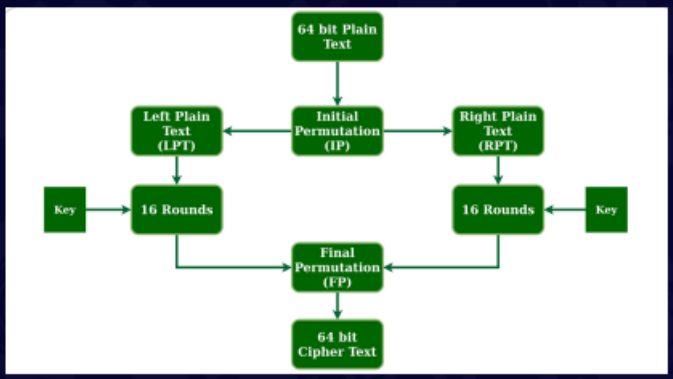
Data Encryption Standard (DES)



The Data Encryption Standard (DES)

- **It** is a **symmetric-key** block cipher. In the year **1977, DES** is published by the **National Institute of Standards and Technology** (NIST).
- It is based on the Feistel structure in which the plaintext is separated into two halves.
- It takes input as **64-bit plaintext** and a **56-bit key** to produce **64-bit ciphertext**.
- Before processing, the entire plain text is separated into two pieces of **32 bits** each, and the same operations are done on each portion.
- Each piece goes through **16** rounds of operations before the final permutation is used to obtain the **64-bit ciphertext.**
- Expansions, permutations, and substitutions are some of the functions used in the rounds, as well as an XOR operation with a round key.
- The same algorithm and key are used for encryption and decryption, with minor differences. The key length is 56 bits.

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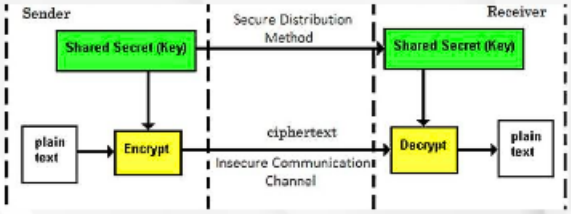
SYMMTERIC ENCRYPTION



Symmetric encryption is a type of encryption that uses the same key to encrypt and decrypt data. This means that both the sender and the receiver of a message must have the same key to communicate securely.

Working

Symmetric encryption is a type of encryption that uses a single secret key to both encrypt and decrypt data. Here's how it works

- Key Generation: The sender generates a secret key, a string of random bits or characters, and shares it with the receiver through a secure channel.
- Encryption: The sender uses the secret key to encrypt the message, which transforms into ciphertext. The encryption algorithm depends on the specific symmetric encryption scheme, such as AES or DES.
- Transmission: The sender sends the encrypted message to the receiver through a communication channel.
- Decryption: The receiver uses the same secret key to decrypt the message to its original format.

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DIGITAL SIGNATURE

- A cryptographic technique to verify the authenticity, integrity, and non-repudiation of digital documents.
- Ensures document integrity and security: Protects against unauthorised modifications or tampering.
- Authenticates the sender: Verifies the identity of the sender, ensuring the document's origin.
- Streamlines business processes: Eliminates physical paperwork and manual signing processes.
- Legal validity and compliance: Digital signatures are legally binding and carry the same weight as handwritten signatures.
- Applications and benefits: Used in finance, healthcare, legal, and government sectors for increased security, reduced administrative burdens, and improved customer trust.